Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Use of Spectrum Bands Above 24 GHz For Mobile Radio Services	)	GN Docket No. 14-177
	)	
Establishing a More Flexible Framework to Facilitate Satellite Operations in the 27.5-28.35 GHz and 37.5-40 GHz Bands	)	IB Docket No. 15-256
	)	
Amendment of Parts 1, 22, 24, 27, 80, 90, 95, and 101 To Establish Uniform License Renewal, Discontinuance of Operation, and Geographic Partitioning and Spectrum Disaggregation and Policies for Certain Wireless Radio Services	)	WT Docket No. 10-112
	)	
Allocation and Designation of Spectrum for Fixed-Satellite Services in the 37.5-38.5 GHz, 40.5-41.5 GHz and 48.2-50.2 GHz Frequency Bands; Allocation of Spectrum to Upgrade Fixed and Mobile Allocations in the 40.5-42.5 GHz Frequency Band; Allocation of Spectrum in the 46.9-47.0 GHz Frequency Band for Wireless Services; and Allocation of Spectrum in the 37.0-38.0 GHz and 40.0-40.5 GHz for Government Operations	)	IB Docket No. 97-95

COMMENTS OF STARRY, INC.

Starry, Inc. (Starry)[1] submits these comments in response to the *Spectrum Frontiers Second Further Notice of Proposed Rulemaking* (*Frontiers Second R&O and Second FNPRM*)[2]

[1] Starry, Inc., is a Boston- and New York-based technology company that is utilizing millimeter waves to re-imagine last-mile broadband access as an alternative to fixed wireline broadband. Starry is currently deploying its proprietary fixed 5G wireless technology in the Boston, Washington, DC, and Los Angeles areas, with plans to expand to our presence to additional U.S. cities in 2018.

[2] *Use of Spectrum Bands Above 24 GHz, et al.*, Second Report and Order, Second Further Notice of Proposed Rulemaking, Order on Reconsideration, and Memorandum Opinion and Order, FCC 17-152, 83 Fed. Reg. 37 (adopted Nov. 16, 2017) (*Frontiers Second R&O and Second FNPRM*) (citations to the *Second R&O and Second FNPRM* herein will reference the FCC published document in place of the Federal Register summary).

to urge the Federal Communications Commission (FCC or Commission) to retain the pre-auction spectrum aggregation limit for the 28 GHz, 37 GHz, and 39 GHz bands; to require that equipment in the 24 GHz band (24.25-24.45 GHz and 24.75-25.25 GHz) be capable of operating across both band segments; and to seek further comment on making the 26 GHz band available for flexible use services, including fixed wireless broadband.

As the world moves forward to create international and domestic regulations to promote access to millimeter wave (mmW) spectrum for advanced wireless services, including 5G, the Commission can continue to lead by finalizing all the rules for all the mmW bands in the near term.[3] The Commission can substantially enhance fixed broadband competition across the United States by reaffirming competition policies that prevent over-aggregation of critical spectrum resources. And, the Commission can ensure global competitiveness by also seeking comment on making the 26 GHz band available for flexible use services, even if only on a limited shared basis.

I. THE COMMISSION SHOULD RETAIN THE PRE-AUCTION REVIEW AND LIMITATIONS ON SPECTRUM HOLDINGS

Spectrum holdings limitations have played an important role in the FCC's competition policy for decades.[4] As a government-controlled input into wireless networks, the Commission has an imperative to ensure competitive access to this public resource.[5] Without robust access to spectrum, competitive providers – fixed or mobile – lack the fundamental input necessary to provide wireless services.[6] The Commission clearly recognized this by establishing a spectrum holdings limit for case-by-case reviews of secondary market transactions and retaining and expanding it through the *Frontiers Second R&O*.[7]

---

[3] In addition to the issues raised in the *Second FNPRM*, we strongly encourage the Commission to adopt final rules for commercial-to-commercial and federal-to-commercial sharing in the 37-37.6 GHz band in its upcoming *Third Frontiers R&O*, and expeditiously schedule an auction for all mmW licenses it holds in its inventory.

[4] *See Policies Regarding Mobile Spectrum Holdings; Expanding Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, Report and Order, 29 FCC Rcd 6133, 6137-43 ¶¶ 7-16 (2014) (*Mobile Spectrum Holdings R&O*).

[5] *See* 47 U.S.C. § 309(j)(3) (requiring the Commission to design systems of competitive bidding that "include safeguards to protect the public interest in the use of the spectrum" and "promot[e] economic opportunity and competition and ensuring that new and innovative technologies are readily accessible to the American people by avoiding excessive concentration of licenses by disseminating licenses among a wide variety of applicants").

[6] *See Mobile Spectrum Holdings R&O*, 29 FCC Rcd at 6142-44 ¶ 17; *Use of Spectrum Bands Above 24 GHz, et al.*, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd 8014, 8078 ¶ 178 (2016) (*Frontiers First R&O and FNPRM*).

[7] *Frontiers First R&O and FNPRM*, 31 FCC Rcd at 8078-84 ¶¶ 178-190; *Frontiers Second R&O and Second FNPRM*, p. 24 ¶ 74.

As the Commission points out, it has made a substantial amount of mmW spectrum available for flexible use services.[8] We strongly support the Commission's efforts to increase the supply of mmW spectrum, and in these comments, urge the Commission to seek comment on adding the 26 GHz band to its inventory for fixed and mobile wireless services. In fact, the Commission has already made more spectrum available than any one provider would need to use to provide an infinitely capable service to its customers.[9] But the absolute quantity of spectrum at auction alone does not ensure a competitive auction that reflects market utility of spectrum resources. By conducting spectrum holdings review at the pre-auction short form application stage, the Commission will create a rational auction that most accurately reflects the market value of the utility of spectrum, and will minimize the likelihood of it holding licenses after the auction concludes and licenses are awarded.

Establishing individual bidders' limits in advance of the auction promotes transparency in the auction and provides all bidders with valuable information that facilitates rational bidding. If the review is conducted post-auction (or not at all), bidders who may exceed the limit after the auction effectively have another dimension of bidding eligibility in the auction. For example, a licensee that holds a substantial amount of mmW spectrum in advance of an auction can buy eligibility for the auction that would exceed the holdings limit. All its existing licenses will then function effectively as additional eligibility. Because of this, the licensee has flexibility not afforded to other licensees – it could acquire many licenses and exceed the limit, and work out the difference with the FCC post-auction. But only the licensee would know what licenses it would intend to keep and what it would intend to return – it would be opaque to all other bidders how the licensee would comply with the limit post-auction (or the extent to which the licensee could argue around the limit under the Commission's case-by-case review). The result is that smaller bidders would be priced out of the auction and be left to pick up the scraps in a subsequent auction.

Further, if the Commission conducts its spectrum holding review after the auction concludes, auction winners can choose which licenses to keep and which to return to the

[8] *Frontiers Second R&O and Second FNPRM*, p. 23 ¶ 73.

[9] Assuming, for instance, a licensee has 1 gigahertz of spectrum and is optimizing for modulation of a moderate 64 QAM, which can support about 4 Bits/Hz of payload, with coding, per spatial stream. With a moderate 8 spatial streams that would mean up to 32 Gbps. If a consumer uses 1 Mbps when streaming video, that would mean the network could support about 4,000 users in one geographic area streaming live video to their smartphones. And even a higher reuse should be possible given the directionality of the phased arrays that will be used.

Commission, including licenses that were acquired before the auction. As a result, the Commission could be left holding a substantial number of licenses, keeping valuable and useful spectrum out of the marketplace for months to years until the next auction. And, assuming that nationwide mobile wireless providers value license portfolios that aggregate large contiguous geographic areas in the same frequency band, the Commission would be left with a patchwork of licenses in non-contiguous geographies and across multiple spectrum bands. These licenses would by nature be of lower utility and lower value.

By allowing parties to acquire more spectrum at auction (because of no-auction related review) the Commission would be creating three classes of spectrum licenses: licenses acquired before an auction, licenses acquired at auction, and licenses acquired after an auction. In order of value, licenses acquired before the auction would be of the highest value, as they would not inherently trigger any spectrum holding review. Licenses acquired at auction would be next, as they too would not trigger a spectrum holding review. Licenses acquired in the secondary market post-auction – if any exist – would be of a different value because those licenses theoretically trigger further competitive review. This valuation would be completely independent of the utility of the spectrum, and instead would flow from regulatory decisions made by the FCC. And it would result in artificially inflated prices at auction.

Nonetheless, a post auction spectrum holdings review is preferable to no auction-related spectrum holdings review. The Commission clearly believes in the value of reviewing and imposing some limits on spectrum holdings, as it reaffirmed in the *Frontiers Second R&O*. In fact, it has a statutory mandate to ensure competitive access to spectrum licenses in auctions.[10] But by allowing infinite aggregation in the auction, the Commission would effectively bless the extreme consolidation of mmW spectrum resources, and the use of private auctions to create a secondary market for excess spectrum. This would result in competitive providers having no access unless granted by a large licensee, and large licensees capturing the excess economic value of those licenses rather than the Commission (and the Treasury) at auction.

Instead, the Commission can enhance fixed and mobile broadband competition by maintaining very reasonable limits on the amount of spectrum a provider may acquire at auction by conducting pre-auction aggregation review.

[10] 47 U.S.C. § 309(j)(3).

II. OPERABILITY IS IMPORTANT TO ENSURE A ROBUST MARKET FOR EQUIPMENT AND DEVICES FOR THE 24 GHz BAND

The Commission has historically ensured that all licensees in new spectrum bands have access to equipment ecosystems through effective operability requirements.[11] It took nearly five years for the Commission to resolve operability issues in the 700 MHz band.[12] It should learn from this experience and build on the existing operability rule in mmW bands by extending it to the 24 GHz band.[13]

All but the largest nationwide wireless providers lack the purchasing power to drive the equipment market.[14] Without operability requirements, these providers are incentivized to inhibit competitive access to network equipment and devices. As result, bands that lack operability may be underdeveloped; history bore this out in the early years of the 700 MHz band.[15]

There is no specific harm or technical issue preventing operability across the 24 GHz band. The Commission should require operability to ensure that all providers have access to the equipment necessary to deploy networks and provide service to customers.

III. THE COMMISSION SHOULD SEEK COMMENT ON THE USE OF THE 26 GHz BAND FOR FLEXIBLE USE SERVICES

As Commissioner O'Rielly noted in his statement at the adoption of the *Frontiers Second R&O and Second FNPRM*, the 26 GHz band is popular internationally for 5G,[16] and the FCC

---

[11] *See Inquiry Into the Use of the Bands 825-845 MHz and 870-890 MHz for Cellular Communications Systems; and Amendment of Parts 2 and 22 of the Commission's Rules Relative to Cellular Communications Systems*, Report and Order, 86 FCC 2d 469, 482 (1981); *Promoting Interoperability in the 700 MHz Commercial Spectrum; Requests for Waiver and Extension of Lower 700 MHz Band Interim Construction Benchmark Deadlines*, Report and Order, 28 FCC Rcd 15122 (*700 MHz Interoperability R&O*) (2013); *Amendment of the Commission's Rules with Regard to Commercial Operations in the 1695-1710 MHz, 1755- 1780 MHz, & 2155-2180 MHz Bands*, Report and Order, 29 FCC Rcd 4610, 4698-99, ¶¶ 229-30 (2014); *Service Rules for Advanced Wireless Services H Block – Implementing Section 6401 of the Middle Class Tax Relief and Job Creation Act of 2012 Related to the 1915-1920 MHz and 1995-2000 MHz Bands*, Report and Order, 28 FCC Rcd 9483, 9498, ¶ 32 (2013); *Frontiers First R&O and FNPRM*, 31 FCC Rcd at 8127 ¶¶ 231-24.

[12] Auction 73 concluded in 2008, and the *700 MHz Interoperability R&O* was adopted in 2013. *See 700 MHz Interoperability R&O*, 28 FCC Rcd at 15122; *Auction of 700 MHz Band Licenses Closes*, Public Notice, 23 FCC Rcd 4572 (2008).

[13] 47 C.F.R. § 30.208; *Frontiers First R&O and FNPRM*, 31 FCC Rcd at 8127 ¶¶ 231-24.

[14] Starry is perhaps the one exception as a retail wireless broadband provider that also develops and manufactures our own base stations and transceivers.

[15] In the 600 MHz band, even with equipment that can operate across the entire band, the absence of the two largest nationwide carriers (and no international availability of the band) has limited its early inclusion in flagship devices. *See* Chris Mills, *T-Mobile Just Got Burned by Apple and the iPhone X*, BGR (Sept. 13, 2017), http://bgr.com/2017/09/13/iphone-x-t-mobile-preorder-release-date-dont-do-it/.

[16] *Frontiers Second R&O and Second FNPRM*, p. 134-35 (Statement of. Cmr. Michael O'Rielly).

should take the most minimum step and seek comment on methods for coexistence between incumbent uses and new terrestrial wireless uses in the U.S.[17]

The International Telecommunications Union is studying the band for IMT-2020 and will consider it for global harmonization at WRC-19.[18] A number of countries have identified the 26 GHz band as a priority for 5G and even taken regulatory steps to make the band available for 5G, including the United Kingdom, Germany, China, and Japan.[19] The U.S. can benefit from this global scale by adding 26 GHz to its supply of mmW spectrum for terrestrial wireless broadband.

We understand that there are incumbent uses in the 26 GHz band, and that those uses should be protected. The U.S. Table of Frequency Allocations indicates that the 25.25-25.5 GHz band is allocated for fixed, mobile, inter-satellite, and standard frequency and time signal-satellite (earth-to-space).[20] The 25.5-27 GHz band is allocated for the same services, plus space research.[21] And the 27-27.5 GHz band is allocated for fixed, mobile, and inter-satellite.[22] To the extent that there are operational federal and non-federal systems under these allocations, the Commission can at least seek comment on whether and how to make the band available for fixed or mobile services while protecting such incumbent uses. It may be technically difficult, and the result may be a severely inhibited band for terrestrial operations. However, there could be uses and users that might be able to effectively coexist with the incumbent systems, and the Commission has the technical and policy tools to explore the best way to ensure coexistence.

We strongly encourage the Commission to include a *Frontiers Third FNPRM* in its upcoming *Frontier Third Report and Order* to set out the existing uses of the 25.25-27 GHz band and seek comment on the technical, policy, and licensing strategies for sharing between the incumbent federal and non-federal uses, and new terrestrial non-federal uses.

****

[17] There is record support for seeking comment on this band. *See* CTIA-The Wireless Association Ex Parte Presentation, GN Docket No. 14-177 (filed July 14, 2017); T-Mobile Comments, GN Docket No. 14-177 (filed Sept. 30, 2016).

[18] World Radio Communication Conference (WRC-15), Final Acts at 298 (2016), http://www.itu.int/opb/ecommercedownload/0015004772-40247-EN.pdf.

[19] *See* 5G Americas, Spectrum Landscape for Mobile Services (Nov. 2017), http://www.5gamericas.org/files/8015/1061/9326/5G_Americas_Whitepaper_Spectrum_Landscape_For_Mobile_Services_11.13.pdf; Ofcom, *5G Spectrum Access at 26 GHz and Update on Bands Above 30 GHz*, Call for Input (July 28, 2017).

[20] U.S. Table of Frequency Allocations, 47 C.F.R. §2.106.

[21] *Id.*

[22] *Id.*

The Commission can ensure U.S. and global competiveness in 5G by conducting spectrum holdings review for the 28, 37, and 39 GHz bands before auction; requiring that equipment in the 24 GHz band be capable of operating across both band segments; and by seeking comment on making the 26 GHz band available for new terrestrial fixed or mobile services, even if heavily restricted in order to protect incumbent systems.

Respectfully submitted,
Starry, Inc.

By: _____
Virginia Lam Abrams
Senior Vice President, Communications & Government Relations

Starry, Inc.
38 Chauncy Street, 2nd Floor
Boston, Massachusetts 02111

January 23, 2018